Panel Comments – *Phase I Passaic River Study, Total Maximum Daily Load for Phosphorus in Wanaque Reservoir, Northeast Water Region, Proposed July 5, 2005, NJDEP.*

January 12, 2006

The NJDEP should be commended on their dedication to improving the water quality in the Passaic River Watershed. The NJDEP has allocated substantial resources in both staff time and funding to produce the best TMDL possible for the impaired waters of this watershed. The TMDL Advisory Panel is excited about the opportunity to provide comments on this TMDL proposal. The Panel typically only comments on the work products that are used as input for the TMDL proposal; the Panel welcomes this opportunity to comment on this proposal.

The TMDL provides a good general description of the pollutant of concern (phosphorus) and the consequences of having excessive phosphorus in a waterbody. It also lays out a two-phased approach for the development of a Passaic River Watershed TMDL in which a basic mass balance model is used to establish, during Phase I, a total phosphorus TMDL for the Wanaque Reservoir and the stream segments that are diverted to the reservoir for water supply purposes, and a dynamic model is used to establish, during Phase II, a TMDL for the impaired stream segments that are contributing load sources to the reservoir.

Although this TMDL is for the Wanaque Reservoir, the TMDL does establish an endpoint for the Phase II modeling effort. Therefore, it is critically important that the predictions from the LA-WATERS modeling effort are accurate. Since the Panel has already provided NJDEP comments on the modeling effort that was used as a basis for this TMDL, we will simply summarize our past comments. Although LA-WATERS is a model that is appropriate for simulating the Wanaque Reservoir, the accuracy of the model predictions are a function of the quality of the input data. The model requires daily inflow loadings from three sources: 1) the Reservoir's tributary watershed, 2) the Pompton Lakes intake, and 3) the Two Bridges Intake. To understand the model's ability to predict ***daily*** in-lake phosphorus concentrations, the quality of these three inputs must be examined.

The main concern of the Panel is that the daily inflow loadings from the Pompton Lakes and Two Bridges intakes were developed using the mass-balance model that is not suitable for modeling instream concentrations or daily loadings in the Passaic River watershed system. This approach does not comply with the requirements of N.J.A.C. 7:15-7.4(a), which reads, in part, "A basic TMDL model may be established for waterbody segments when insufficient data are available to develop a complex TMDL model and the complexity of the waterbody segment and the wasteload inputs to the waterbody segment do not justify development of a complex TMDL model...." This subsection makes no distinction between lakes and impoundments, on the one hand, and rivers and streams, on the other. The clear language of this provision relates to

"waterbody segment(s)," regardless of hydrologic category. To employ a basic TMDL model, NJDEP bears the burden of showing that (a) insufficient data are available to develop a complex TMDL model and (b) the waterbody segment, including its wasteload inputs, is insufficiently complex to justify the development of a complex TMDL model. Neither showing has been attempted in this proposal.

Moreover, it is arguable that this proposal does not comply with N.J.A.C. 7:15(b)(2), which states that "a basic TMDL model (using only a mass balance) shall not be established for any pollutant or pollutant parameter which has a substantial direct effect on the dissolved oxygen dynamics of the stream...." Assuming that the term "stream" should be read as a generic reference to waterbody segments and not limited to hydrologic streams, as distinguished from lakes or impoundments (some tributary streams are included in this Phase I proposal), the NJDEP's description of total phosphorus as a Pollutant of Concern (p. 6) indicates that "...the respiration cycle of excessive plant material can cause significant swings in pH and dissolved oxygen, which can result in violation of criteria for these parameters and can adversely affect the remainder of the aquatic community," which could reasonably be interpreted as positing a direct (in the sense of "causal" or "predictable") and substantial impact of total phosphorus loadings on dissolved oxygen dynamics.

The model that is being developed for the Phase II study may be more appropriate for generating the time series input data needed for the LA-WATERS model, provided the Phase II model is properly calibrated and validated. The Phase II model should at least be used to confirm that the daily input loadings that were used in this TMDL are accurate. Another concern of the Panel was that while the LA-WATERS model does a reasonable job at predicting monthly average phosphorus concentrations in the reservoir, it has difficulty predicting the extreme values (i.e., the minimum and maximum concentrations).

In addition to the random error associated with total phosphorus predictions described in Table 9 (“5.0 Analytical Approach and TMDL Calculation,” page 24), is there any bias to the Phase I predictions? That is, does the predicted phosphorus at low flow tend to be either higher or lower than observed? We would think that the nature of the processes that are ignored in the conservative model would tend to remove phosphorus, and therefore the predicted phosphorus would be too high. The consequence of this would be to require more removal of phosphorus than is necessary for the protection of the Wanaque Reservoir. An examination of the correlations in the Najarian report of 7-1-05 in Figures 3-18 to 3-25 (upon which this is based) indicate the problem. A good correlation would be indicated not by high r^2, but rather by a slope close to 1.0. In all but one case the regression gives a slope much less than 1.0. As a result, at low concentrations, the model tends to over-predict total phosphorus.

If a model is used to develop a TMDL based on a “not to exceed at any time” phosphorus standard, it is essential that the model do a reasonable job predicting the minimum and maximum concentrations. However, since the observed data appear to show that the in-lake dissolved oxygen and chlorophyll-a concentrations are not a function of daily

fluctuations in total phosphorus, but more a function of long-term average phosphorus concentrations, a monthly or seasonal average total phosphorus standard may be more appropriate for the Wanaque Reservoir.

Regarding the allocation of loading capacity, the Panel commends the NJDEP for providing opportunities in the TMDL for water quality trading, which could provide a cost effective implementation of the TMDL. The Panel has reservations that the urban and agricultural reductions of 80% can be attainable. In light of the general lack of enforceable legal mechanisms for controlling nonpoint source pollution, it is doubtful whether an 80% nonpoint source reduction would be an achievable goal. Furthermore, even if we could "turn off" all inputs today, an 80% reduction is probably not achievable over the next ten to twenty years due to the build-up of phosphorus in the watershed. This level of nonpoint source reduction may not be practically achievable at all without major changes to the way individuals, farmers, towns, and corporations manage their land.

According to NJDEP's Stormwater Best Management Practice (BMP) Manual, the bioretention system (clearly NJDEP's most highly recommended BMP) can only achieve 60% reduction in total phosphorus, which is the highest phosphorus removal efficiency offered in the Manual for any recommended BMPs. Although stormwater management ordinances could be used to also decrease phosphorus loads, there are virtually no data demonstrating that the passage of any ordinance actually improves water quality. Even if the municipalities agree to pass phosphorus reduction ordinances, it will be difficult to enforce them on a watershed-wide basis. Reductions of 20% to 40% are recommended and have a much better chance of being achieved by the MS4s and the farmers.

Some of the data on current loads in Table 19 ("5.0 Analytical Approach and TMDL Calculation," page 35) are questionable. If the concentrations are computed using the current flow and load, five of the sources are already below 0.20 mg/l (as low as 0.02 for the Oakland-Chapel Hill Estates), and all but three are less than 0.6 mg/l. Is this realistic? Are these small facilities practicing nutrient removal already? This needs to be verified, because if total phosphorus is not already being removed to such low levels, then these facilities will also need to have a load reduction requirement.

Can diversions be anticipated by days in advance? If so, wouldn't it be reasonable to require point sources to be prepared to meet their WLA, but not actually treat until a diversion is expected? This might be reasonable if the treatment involved chemical addition subsequent to biological wastewater treatment. In such a case, chemical addition greatly increases sludge production, and therefore disposal costs. If this can be avoided when unnecessary, much of the potential hardship on utilities could be avoided.

The "Implementation Plan," is a courageous, knowledgeable, and thorough attempt, on the part of NJDEP, to achieve the extensive load reductions detailed on page 25 of the proposal. The Implementation Plan realistically concludes that although it may be impossible, for technological or economic reasons, to achieve these reductions over the short term, the NJDEP will practice adaptive management to assure future compliance

with water quality standards without imposing extreme, immediate demands on dischargers that might jeopardize their economic viability or societal function.

Regarding the requirement for all municipalities to pass and enforce a low phosphorus fertilizer ordinance, such ordinances would require a major public education and outreach effort. The passage of a low phosphorus fertilizer ordinance could result in homeowners not applying any fertilizer to their lawns, which in certain circumstances could yield unhealthy lawns that increase erosion and nutrient runoff.

In conclusion, the Panel is still concerned that the use of a conservative model mass-balance approach is not suitable for modeling instream concentrations or daily loadings in the Passaic River watershed system. This approach, which was used to develop the daily inflow loadings from the Pompton Lakes and Two Bridges intakes, does not comply with the requirements of N.J.A.C. 7:15-7.4(a). The Department has failed to demonstrate that the use of this approach is justified for this system. Additionally, the Panel is concerned that although the reservoir model does a reasonable job at predicting monthly average phosphorus concentrations in the reservoir, it has difficulties predicting daily total phosphorus fluctuations. If the model is used to develop a TMDL based on a "not to exceed at any time" standard, the model must therefore do a reasonable job at predicting the daily fluctuations, as well as the minimum and maximum concentrations in the system. Such is not the case with this model. In order to obviate the need for high resolution (daily) total phosphorus predictions, the Panel suggests that the Department consider a monthly or seasonal average total phosphorus standard for the Wanaque Reservoir since the observed data indicate that the in-lake dissolved oxygen and chlorophyll-a concentrations are more a function of, or more closely related to, the long-term average phosphorus concentrations, rather than the daily fluctuations in phosphorus concentrations. Finally, the Panel has strong reservations about how realistic is the goal of 80% nonpoint source reduction. This level of reduction may not be practically achievable over the next ten to twenty years due to the build-up of phosphorus in the watershed.

General Editorial Comments:

1. Although the TMDL provides a good general description of the pollutant of concern and the consequences of having excessive phosphorus in a waterbody, a paragraph illustrating the effects of phosphorus on downstream designated users should be added (e.g., explain the potential health and/or water treatment related adverse effects of high phosphorus concentrations on the Wanaque reservoir).

2. In Table 3 ("3.0 Pollutant of Concern and Area of Interest," page 8), the last column, "Approx. River Miles," needs to be clarified. Is this the length of a segment or the distance of the site from a reference location? The term "River Miles" usually means the distance from the mouth of the river. Also, the caption should clarify whether each row refers to a specific location, as implied by the first column, or a river reach, as implied by the use of the words "stream segments."

3. Phosphorus is misspelled in the legend for Figure 1 found on page 11.

4. In section "Nonpoint Sources" ("4.0 Source Assessment," page 20) the equation given is said to be used with an iterative procedure to compute a concentration. A few details of this procedure should be provided. Specifically, which values are given, and which are adjusted during the iterations. It seems that C_{run} in this equation could be computed explicitly. Why was iteration required? The exact interpretation of C_{run} and its use should be explained. Is it the average runoff concentration? The results of this calculation are not given in Table 8 (page 21) as stated. Table 8 contains input data.

5. Several of the tables contain superscript notes or asterisks that are not listed as footnotes/endnotes (e.g., Tables 7, 8, 9, 19).

6. The following sentence from page 18 is confusing: "Point sources contributing phosphorus loads within the affected drainage area are limited to stormwater point sources, including the Tier A municipalities listed in Appendix B." Does this refer only to the direct tributaries? This needs clarification.

7. "Significant" should be defined as used in the title for Table 7 on page 19.

8. There is a second Table 8 on page 23.

9. Do the statistics in Table 9 mean that on average the error is about 0.1 mg/l? The statistics presented in this table need further explanation than is presented in the proposal.

10. Footnote 2 for Table 11 and subsequent tables with the same footnote should be as follows: = [1-(TMDL load/Existing load] *100.

11. Table 12 on page 28 needs additional footnotes to clarify the numbers presented in the row designated as "Point Sources other than Stormwater NJPDES Discharges." Does the 149 lbs TP/yr represent an increase because of increased flow? Also, the 0% is actually a negative number (i.e., -303%).

12. Under "6.0 Follow-up Monitoring," more specifics on the mentioned targeted studies should be provided. This section should also address data gaps identified in past and on-going TMDL studies. Also, the fourth sentence in this section should read "The data from these…."

13. The effectiveness of the various implementation measures described in "7.0 Implementation Plan" does not appear to be well-supported as presented in the proposal. References and relevant data from other studies and communities should be provided.